PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Akira KITANI et al.

Application No.: 10/579,295

Filed: May 15, 2006 Docket No.: 127993

For: BI-ASPHERICAL TYPE PROGRESSIVE-POWER LENS AND METHOD OF DESIGNING THE SAME

PETITION TO MAKE SPECIAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

It is respectfully requested that examination of the above-identified application be accelerated and made special under the provisions of 37 CFR §1.102 and MPEP §708.02.VIII.

Attached hereto is our Check No. 183373 in the amount of $130.00 in payment of the fee under 37 CFR §1.17(h). Please credit or debit Deposit Account No. 15-0461 as necessary in order to effect entry of this paper. Two duplicate copies of this paper are attached.

It is respectfully submitted that all claims of this application are directed to a single invention. If the Patent Office determines otherwise, Applicants will make an election without traverse.

A pre-examination search was as evidenced by the attached International Search Report. The field of search is set forth in the International Search Report. The search was made on the basis of the subject matter recited in the pending claims.

An Information Disclosure Statement submitting the references cited in the International Search Report and mentioned in the specification is filed herewith. The relevance of the references mentioned in the specification is discussed in the specification. A detailed discussion of the references cited in the International Search Report, including how the claimed subject matter is patentable over the references, is attached hereto as Appendix A.

It is respectfully submitted that all requirements for accelerated examination are met. Accordingly, it is respectfully requested that this application be made special.

Further, in view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-24 are earnestly solicited.

Should the Examiner believe that anything further would be desirable to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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Attachments:
Preliminary Amendment
Information Disclosure Statement
Appendix A

Date: August 23, 2006

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DEPOSIT ACCOUNT USE
AUTHORIZATION
Please grant any extension
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Application No.: 10/579,295

APPENDIX A

Difference between the references cited in international examination and the present invention

Document 1 : WO 00/62116 A1&US 6712467 B1 & EP 1170620 A1

Document 1 : JP 2001-209012 A

Document 3 : JP 2000-227579 A & US 6186627 B1

Document 4 : JP 10-123469 A & US 5892565 A1

Document 5 : JP 9-90291 A & US 5708492 A1 & EP 0872755 A1

Document 6 : JP 2001-021846 A

* The present invention

The present invention provides a bi-aspherical type progressive-power lens which provides an excellent visual acuity correction for prescription values and a wide effective visual field with less distortion in wearing, by reducing a magnification difference of an image between a distance portion and a near portion of a lens, and a method of designing the same.

A progressive action of a progressive-power lens is divided in the vertical direction and the horizontal direction of the lens and then an optimal sharing ratio between the front and rear two surfaces of the object side and the eyeball side is set in each direction to configure one bi-aspherical type progressive-power lens, a sharing ratio of a progressive action in the horizontal direction of a rear surface (eyeball side surface) is set higher so that an advantage of increasing the visual field in the horizontal direction can be obtained, a sharing ratio of a progressive action in the vertical direction of a front surface (object side surface) is set higher so that a disadvantage of increasing an eyeball turning angle between the distance and near portions in the vertical direction can be restrained, also a wide effective visual field with less distortion in wearing

can be provided by reducing a magnification difference of an image between the distance portion and the near portion on the progressive-power lens, further making it possible to obtain a bi-aspherical type progressive-power lens capable of reducing a machining time and cost by making it possible to machine only the surface of an eyeball side as a bilaterally asymmetrical curves surface in consideration of a convergence action of an eye in near vision after receiving an order, by using "bilaterally symmetrical semi-finished product" as an object side surface of the progressive refractive power lens.

A bi-aspherical type progressive-power lens of the invention 1 (claims 1 and 2) of this application is the bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface,

wherein when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement position F1, are DHF and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, relation of DHn and DVn are expressed by

$DHf + DHn < DVf + DVn$, and $DHn < DVn$,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives a far vision diopter (Df) and an addition diopter (ADD) based on prescription values, and

a distribution of astigmatism on the first refractive surface is bilaterally symmetrical with respect to one meridian passing through the far vision diopter measurement position F1, a distribution of

astigmatism on the second refractive surface is bilaterally asymmetrical with respect to one meridian passing through a far vision diopter measurement position F2 of the second refractive surface, and a position of a near vision diopter measurement position N2 on the second refractive surface is shifted inward to a nose by a predetermined distance.

A method of designing the bi-aspherical type progressive-power lens of the invention 2 (claims 3 and 4) of this application is the bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface,

wherein when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement position F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

$DHf + DHn < DVf + DVn$, and $DHn < DVn$,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives a far vision diopter (Df) and an addition diopter (ADD) based on prescription values, and

a distribution of astigmatism on the first refractive surface is bilaterally symmetrical with respect to one meridian passing through the far vision diopter measurement position F1, a distribution of astigmatism on the second refractive surface is bilaterally asymmetrical with respect to one meridian passing through a far vision diopter measurement position F2 of the second refractive surface, and a position of

a near vision diopter measurement position N2 on the second refractive surface is shifted inward to a nose by a predetermined distance.

The bi-aspherical type progressive-power lens of the invention 3 (claims 5 and 6) of this application is the bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first reractive surface being an object side surface and a second refractive surface being an eyeball side surface,

when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement position F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

$DHf + DHn < DVf + DVn$, and $DHn < DVn$,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives a far vision diopter (Df) and an addition diopter (ADD) based on prescription values, and

a distribution of average diopter on the first refractive surface is bilaterally symmetrical with respect to one meridian passing through the far vision diopter measurement position F1, a distribution of average diopter on the second refractive surface is bilaterally asymmetrical with respect to one meridian passing through a far vision diopter measurement position F2 of the second refractive surface, and a position of a near vision diopter measurement position N2 on the second refractive surface is shifted inward to a nose by a predetermined distance.

A method of designing a bi-aspherical type progressive-power lens of the invention 4 (claims 7 and 8) of this application is the method of designing the bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface,

wherein when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement position F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

$$DHf + DHn < DVf + DVn, \text{ and } DHn < DVn,$$

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives a far vision diopter (Df) and an addition diopter (ADD) based on prescription values and

a distribution of average diopter on the first refractive surface is bilaterally symmetrical with respect to one meridian passing through the far vision diopter measurement position F1, a distribution of average diopter on the second refractive surface is bilaterally asymmetrical with respect to one meridian passing through a far vision diopter measurement position F2 of the second refractive surface, and a position of a near vision diopter measurement position N2 on the second refractive surface is shifted inward to a nose by a predetermined distance.

The bi-aspherical type progressive-power lens of the invention 5 (claims 9 to 14) of this application is the bi-aspherical type progressive-power lens with a

progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface,

wherein when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by,

DVn - DHn > ADD/2,

a surface astigmatism component at N1 of the first refractive surface is offset by the second refractive surface, and a combination of the first and second refractive surfaces gives a near vision diopter (Dn) based on prescription values.

A method of designing a bi-aspherical type progressive-power lens of the invention 6 (claims 15 to 20) of this application is the method of designing the bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface, wherein

when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

DVn - DHn > ADD/2,

and a surface astigmatism component at N1 of the first refractive surface is offset by the second refractive surface, and a combination of the first and second refractive surfaces gives a near vision diopter (Dn) based on prescription values.

A bi-aspherical type progressive-power lens of the invention 7 (claim 21) of this application is the bi-aspherical type progressive-power lens with a

progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface, wherein

when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision measurement position F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a nearsightedness diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

$DVn - DVf > ADD/2$,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives an addition diopter (ADD) based on prescription values, and

on a sectional curve in the vertical direction passing through F1, at an arbitrary position in a rectangle surrounded by two horizontal lines located at ± 4mm in the vertical direction, with a position providing 50% of a change of a sectional diopter in the vertical direction ranging from F1 to the same height as N1 being the center, and two vertical lines located at ± 15mm in the horizontal direction from a straight line in the vertical direction passing through F1,

a surface sectional diopter in the vertical direction on the first refractive surface has differential values such that the absolute value of a differential value in the vertical direction is larger than the absolute value of a differential value in the horizontal direction.

A bi-aspherical type progressive-power lens of the invention 8 (claim 22) of this application is the bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted

to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface, wherein

when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement position F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

$DVn - DVf > ADD/2$,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives an addition diopter (ADD) based on prescription values, and

on a sectional curve in the vertical direction passing through F1, at an arbitrary position in a rectangle surrounded by two horizontal lines located at ± 4mm in the vertical direction, with position providing 50% of change of a sectional diopter in the vertical direction ranging from F1 to the same height as N1 being the center, and two vertical lines located at ± 15mm in the horizontal direction from a straight line in the vertical direction passing through F1,

a surface astigmatism amount on the first refractive surface has differential values such that the absolute value of a differential value in the vertical direction is larger than the absolute value of a differential value in the horizontal direction, and

at an arbitrary position in the rectangle,

a surface average diopter on the first refractive surface has differential values such that the absolute value of a differential value in the vertical direction is larger than the absolute value of a differential value in the horizontal direction.

A method of designing a bi-aspherical type progressive-power lens of the invention 9 (claim 23) of this application is the method of designing a bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface, wherein

when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement position F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

$DVn - DVf > ADD/2$,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives an addition diopter (ADD) based on prescription values, and

on a sectional curve in the vertical direction passing through F1, at an arbitrary position in a rectangle surrounded by two horizontal lines located at ± 4mm in the vertical direction, with a position providing 50% of a change of a sectional diopter in the vertical direction ranging from F1 to the same height as N1 being the center, and two vertical lines located at ± 15mm in the horizontal direction from a straight line in the vertical direction passing though F1,

a surface sectional diopter in the vertical direction on the first refractive surface has differential values such that the absolute value of a differential value in the vertical direction is larger than the absolute value of a differential value in the horizontal direction.

A method of designing a bi-aspherical type progressive-power lens of the invention 10 (claim 24) of this application is the method of designing a bi-aspherical type progressive-power lens with a progressive refractive power action dividedly allotted to a first refractive surface being an object side surface and a second refractive surface being an eyeball side surface, wherein

when on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a far vision diopter measurement positon F1, are DHf and DVf respectively, and

on the first refractive surface, a surface refractive power in a horizontal direction and a surface refractive power in a vertical direction, at a near vision diopter measurement position N1, are DHn and DVn respectively, the relation of DHn and DVn is expressed by

DVn - DVf > ADD/2,

surface astigmatism components at F1 and N1 of the first refractive surface are offset by the second refractive surface, and a combination of the first and second refractive surfaces gives an addition diopter (ADD) based on prescription values, and

on a sectional curve in the vertical direction passing through F1, at an arbitrary position in a rectangle surrounded by two horizontal lines located at ± 4mm in the vertical direction, with a position providing 50% of a change of a sectional diopter in the vertical direction ranging from F1 to the same height as N1 being the center, and two vertical lines located at ± 15mm in the horizontal direction from a straight line in the vertical direction passing through F1, a surface astigmatism amount on the first refractive surface has differential values such that the absolute value of a differential value in the vertical direction is larger than the absolute value of a differential value in the horizontal direction, and

at an arbitrary position in the rectangle,

a surface average diopter on the first refractive

surface has differential values such that the absolute value of a differential value in the vertical direction is larger than the absolute value of a differential value in the horizontal direction.

* Document 1

The document 1 provides a progressive refractive power glasses lens excellent in a wearing feeling even when it is formed to have a tines desirable in terms of weight and design by providing a gentle base curve.

The progressive refractive power glasses lens of the document 1 is characterized by being designed so that; when a distance section consists of a far-sightness correction lens having a positive refractive power, setting an astigmatism on the lens surface at each point on a main close observation line of the distance section to zero is not prioritized, and, instead, minimizing a transmission astigmatism at each point on the main close observation line is prioritized; while, when the distance section consists of a near-sightness correction lens having a negative refractive power, setting an astigmatism on the lens surface at each point on the main close observation line of the distance section to zero is not prioritized, and, instead, minimizing a transmission average refractive power error at each point on the main close observation line is prioritized.

According to the document 1, the lens is designed in consideration of an adjusting ability of an eyeball.

* Document 2

A progressive multifocal lens of the document 2 is characterized in that when entry power are within a range of the 0.75 to 3.00 diopters, and the width of the area where an astigmatic value along the curved line of the horizontal cross section which passes a measuring point N for a power of near vision is X diopter or less is set to W (Di, X) mm, in the relation of two kinds of lenses A and B of which the entry degree (Di) is shown by Da diopter and Dd diopter, respectively, when the entry degree (Di) is Da>Db, W (Da, X) is ≥W (Db, X.Db/Da), wherein X is 1.00 diopter.

According to the progressive multifocal lens of the

document 2, a tendency that a near vision clear region becomes narrower when the entry power becomes larger is relaxed.

* Document 3

A progressive power lens having a negative dioptric power for distance vision, wherein a progressive surface is formed on the back surface of said progressive power lens;

wherein the value of a surface power Pf.sub.m of said progressive surface in the main meridional plane at a first point on the main meridian in a distance portion of said progressive power lens is less than the value of a surface power Pf.sub.s of said progressive surface in a plane perpendicular to said main meridional plane at said first point (Pf.sub.m <Pf.sub.s);

wherein the value of a surface power Pn.sub.m of said progressive surface in said main meridional plane at a second point on said main meridian in a near portion of said progressive power lens is greater than the value of a surface power Pn.sub.s of said progressive surface in a plane perpendicular to said main meridional plane at said second point (Pn.sub.m >Pn.sub.s); and

wherein said surface power P is defined by the following condition:

wherein "n" represents the refractive index of said progressive power lens; and

"r" represents the radius of curvature at one of said first point and said second point on said main meridian in said near portion and said distance portion, respectively.

* Document 4

A progressive multifocal lens comprising:

a lens refracting surface divided along a main meridian curve into a nasal zone and a temporal zone; said surface having:

a first zone for near vision correction with a surface refractive power corresponding to the near distance;

a second zone for defined vision distance correction with a surface refractive power corresponding to a defined distance spaced from said near distance; and

a progressive zone between said first and second zones in which the surface refractive powers of both said first and second zones are continuously connected, wherein the center of said first zone is separated from the near eyepoint by a distance of 2 mm to 8 mm downward along said main meridian curve, and wherein the following condition is satisfied:

where:

K.sub.E is the refractive power at said near eyepoint;

K.sub.A is the refractive power at the center of said second zone; and

K.sub.B is the refractive power at the center of said first zone.

* Document 5

A progressive power multifocal lens having fundamental elements, which include a far vision power measuring position (F) and a near vision power measuring position (N), and belonging to a group of progressive power multifocal lenses designed under a predetermined rule in such a manner that the fundamental elements meet a common wearing purpose,

wherein a surface refractive power (in units of diopters) at the far vision power measuring position (F) is employed as a base curve (Bi),

wherein a difference in surface refractive power between the far vision power measuring position (F) and the near vision power measuring position (N) is employed as an addition (Di (in units of diopters)),

wherein arbitrary selection of two progressive power multifocal lenses, whose additions are Da and base curves are B1 and B2, respectively, from the group of the progressive power multifocal lenses, the following relation holds for B1>B2:

W(Da, B1)>W(Da, B2)

where W(Da, Bi) (i=1 or 2) is a width of a region in which values of a surface average additional refractive power along a horizontal section line extending below the near vision power measuring position (N) are not less than Di/2.

In the case of the "distribution of the transmission average additional refractive power", the width W of a region, in which values of a surface average additional refractive power along a horizontal section line extending below the near vision power measuring position N are not less than one-half the addition, becomes narrower when the far vision power is positive, and the width W becomes wider when the far vision power is negative, in comparison with that in the case of the "surface average additional refractive power distribution".

Hence, the width W in the case of the positive far vision power is set in such a manner as to be wider than that in the conventional case, while the width W in the case of the negative far vision power is set in such a way as to be narrower than that in the conventional case. Thereby, the "transmission average additional refractive power distribution", which is closer to the suitable distribution serving the essential purpose, can be obtained.

* Document 6

A progressive focus lens for spectacles having a far sight region and near sight region, and a progressive region where a refracting power changes progressively between both regions,

werein, an astigmatism degree of the far sight region and the astigmatism degree of the near sight region individually set, based on a measured far sight astigmatism degree and a measured near sight astigmatism degree of a spectacle wearer.

* Difference between the present invention and the documents 1 to 5

The documents 1 to 5 neither describe nor suggest any structure of the inventions 1 to 10 of this application. In addition, the structure of the present invention can not be obtained even when the documents 1 to 5 are combined.

According to the documents 1 to 5, either one of an object side surface or a eyeball side surface has a progressive refractive power action, and therefore the structures of these documents are completely different from that of the present invention wherein a progressive action of a progressive-power lens is divided in the vertical direction and the horizontal direction of the lens and then an optimal sharing ratio between two surfaces of the object side and the eyeball side is set in each direction to configure one bi-aspherical type progressive-power lens.

In addition, the documents 1 to 5 do not describe the point that surface astigmatism components at a far vision diopter measurement position and a near vision diopter measurement position of a refractive surface of the object side is offset by the refractive surface of the eyeball side.